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Fatty acids modulate transmitter release and functioning of potassium channels in motor nerve endings

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Abstract

An extracellular microelectrode applied to the neuromuscular junction of the frog sternocutaneus muscle was used to study effects of saturated (myristic and arachidic) and unsaturated (arachidonic and oleic) fatty acids on transmitter release and potassium currents in a nerve ending. All these fatty acids decreased evoked transmitter release. Unsaturated fatty acids decreased the amplitude of voltage-dependent and calciumactivated potassium currents in a nerve ending, whereas saturated acids were ineffective. Rhythmic stimulation applied in the presence of arachidonic and oleic acids induced more pronounced facilitation of the transmitter release, whereas the effects of myristic and arachidic acids did not differ from control values. Deoxycholate was not able to reproduce the effects of fatty acids on the transmitter release and potassium current in a nerve ending. It was concluded that fatty acids can modulate transmitter release and synaptic excitatory transmission; these effects can have a significant influence on molecular mechanisms of exocytosis of synaptic vesicles and electrogenesis in a motor nerve ending. The latter effect is characteristic of unsaturated (arachidonic and oleic) acids, whereas the former effect does not depend on the degree of unsaturation at all. © Pleiades Publishing, Ltd. 2007.

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Keywords

Arachidic acid, Arachidonic acid, Myristic acid, Neuromuscular synapse, Oleic acid, Transmitter release, Voltage-dependent and calcium-activated potassium currents